

# Causes of a painful total knee arthroplasty. Are patients still receiving total knee arthroplasty for extrinsic pathologies?

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## Abstract

**Purpose** Whilst patients undergoing total knee replacements generally have good relief of their symptoms, up to 20% complain of persisting pain. Revision rates have therefore been rising, particularly so for unexplained pain. We reviewed the causes of painful total knee replacements including extrinsic causes.

**Methods** Forty-five consecutive patients referred to our department with painful total knee replacement were reviewed with our standard protocol, including history and examination, inflammatory markers and radiological studies including radiographs of the hip and knee and computed tomography scan of the knee joint.

**Results** Of the 45 patients, 15 patients had degenerative hip and lumbar spine disease which resolved after injections of the relevant joints. Nine patients had unexplained pain.

**Conclusions** Patients may still be undergoing knee arthroplasty for degenerative lumbar spine and hip osteoarthritis. We suggest heightened awareness at pre- and post-operative assessment and thorough history and examination with the use of diagnostic injections to identify the cause of pain if there is doubt.

## Introduction

In 2010, almost 77,000 knee replacements were implanted in England and Wales, an increase of 2.5% from 2008 [1]. Total knee replacement (TKR) has the potential to significantly improve a patient's quality of life [2, 3]; however,

around 20% of patients do not achieve satisfactory outcomes [4–6]. Revision rates have also been on the increase, increasing 11% from 2009, equivalent to over 5,000 revisions. The number of revisions for unexplained pain has also risen from 729 to 810 [1].

Common causes of revision in order of frequency include polyethylene wear, aseptic loosening, instability, patellofemoral joint (PFJ) arthritis, infection and component malposition [7, 8]. Evaluation of a painful TKR involves careful history, examination, inflammatory markers and radiographic evaluation; however, tests are often equivocal. Furthermore, persistent pain following TKR may also arise from pathology distant to the knee such as degenerative hip or lumbar spine pathologies.

It is widely accepted that revision surgery should only be undertaken once the aetiology of failure has been established [9–11], otherwise patient outcomes are unlikely to improve [12]. However, in certain cases where pain persists and fails to respond to medical therapy, open exploration may occur, which has far less certain outcomes [13]. Coupled with the severe significant emotional and physiological distress revision surgery causes [14, 15], the decision to undertake revision surgery remains an important, albeit difficult decision to make.

Several authors have suggested diagnostic algorithms for analysis of painful TKRs [16, 17]. Most studies have looked into the specific causes of intra-articular and intra-operative findings requiring revision; however, there are no studies which analyse all causes of painful TKRs including pathologies from the degenerative hip and lumbar spines.

We present our experience of 45 consecutive patients referred to our department with painful, failed total knee arthroplasty and analyse the common aetiologies of perceived failures.

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## Materials and methods

Between 2007 and 2009, 45 consecutive patients with painful total knee arthroplasties were referred to our department and were evaluated by the senior author (MC). Referrals were from local general practitioners and orthopaedic surgeons.

There were 19 men and 26 women. The average age of the men was 72.4 years (range 51–87 years), and the average age of the women was 73.4 years (range 50–90 years). The indications for primary surgery were primary osteoarthritis ( $n=42$ ), rheumatoid arthritis ( $n=2$ ) and post-traumatic arthritis ( $n=1$ ). The average time from TKR to review in clinic was 2.9 years post-operatively (range six months to 13 years).

Patients underwent our revision assessment protocol including history and examination, inflammatory markers [WBC, C-reactive protein (CRP), erythrocyte sedimentation rate (ESR)] and radiological evaluation.

Radiological evaluation consists of weight-bearing anteroposterior (AP), lateral and skyline knee radiographs, long leg/hip radiographs and a computed tomography (CT) scan of the knee. AP, lateral and skyline knee radiographs are used to assess component fixation, position, sizing, component failure or osteolysis. Long leg/hip radiographs assess any ipsilateral hip osteoarthritis and varus/valgus malalignment, and CT scans check positioning of the implants, rotation of the femoral component or for signs of loosening. If the presence of low-grade infection is suspected from assessment, an aspiration of the knee in theatre may be performed. Further investigations and procedures may be warranted if the source of pain is suspected to be from outside the knee, including magnetic resonance imaging (MRI) spine or hip/spine steroid injections.

## Results

All 45 “painful knee arthroplasties” were available for follow-up (24 right, 21 left). The diagnoses made are shown in Table 1.

In nine cases, no cause was found for the persistent pain and referral to the pain team was made. None had exploratory surgery. In eight cases (18%), degenerative lumbar spine (Fig. 1) was found to be the cause of pain, and this was confirmed on MRI, and by the patients having complete resolution of symptoms after nerve root injections. In seven cases (16%), moderate to severe ipsilateral hip osteoarthritis was found to be the cause which also settled after injection ( $n=4$ ) or total hip arthroplasty ( $n=3$ ) (Fig. 2).

Six cases (13%) were diagnosed as deep infection and were subsequently revised in a two stage procedure; the first stage involved removal of metalwork, debridement of all infected tissue and insertion of antibiotic impregnated cement spacer. The second stage was performed once inflammatory markers

**Table 1** Diagnoses

Diagnosis of painful TKR	Number of patients
No cause diagnosed	9
Degenerative lumbar spine	8
Hip osteoarthritis	7
Deep infection (two stage revision)	6
Spontaneous resolution	3
Malposition	2
Neuropathy	2
Oversizing of femoral component	2
Rheumatoid arthritis	2
Tight lateral retinaculum	2
MCL tear	1
Loosening	1

*MCL* medial collateral ligament

and clinical examination revealed no sign of infection. All six cases had a history of pain since the operation and raised inflammatory markers (CRP >20 and ESR >40) and three (50%) had wound complications. Only one case showed signs of loosening on CT.

In three patients, the pain demonstrated gradual improvement over the two years after surgery. Malrotation of the femoral components was the cause of pain in two patients, which was demonstrated on CT scan, causing patellofemoral maltracking and subsequent pain when ascending and descending stairs and kneeling. Both patients declined revision surgery as they felt that their symptoms did not warrant further surgery and are currently under review.

Aseptic loosening of both the femoral and tibial components secondary to polyethylene wear was the cause in one patient. Initially the patient was pain free after his primary knee replacement until the 13th year, when he started to develop pain.

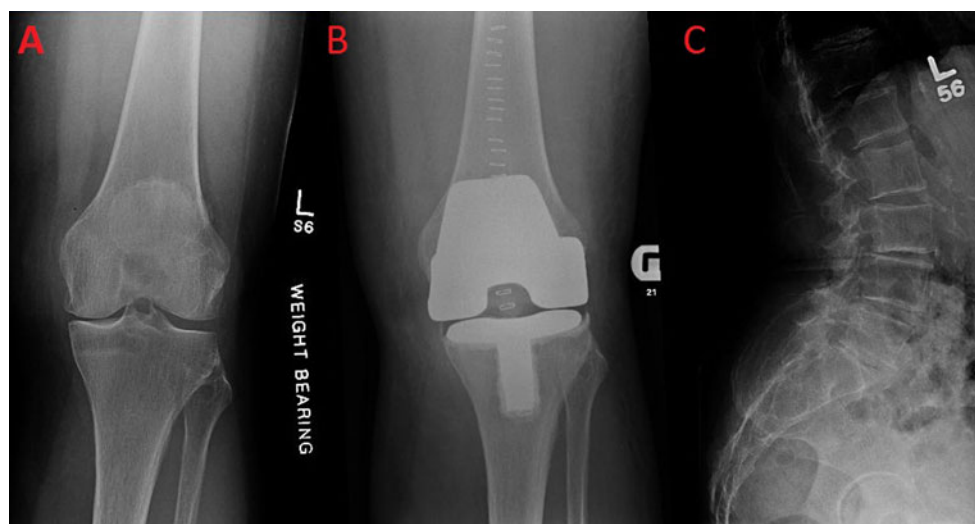
Oversizing of the femoral component and overstuffing of the PFJ was the cause of pain in two patients. These patients both had persistent pain from the beginning and both had had a posterior reference system without patellar resurfacing. We did notice a difference between patients who had their patella resurfaced or those who had not.

Peripheral neuropathy secondary to diabetes mellitus was the cause of pain in two patients. Recurrent synovitis secondary to rheumatoid arthritis was the cause of pain in two patients. Both patients' symptoms resolved when medical therapy was modified.

Two patients had tight lateral retinacular structures causing patellofemoral pain. In both cases, the pain resolved after diagnostic local anaesthetic injection and settled with physiotherapy.

A grade 2 medial collateral ligament tear confirmed on MRI was the cause of pain in one patient; this improved with physiotherapy and orthosis management.

**Fig. 1** **a** AP left knee radiograph demonstrating mild medial compartment osteoarthritis. **b** AP left knee radiograph revealing a well-positioned TKR at 1 week post-operatively. **c** Persisting pain at 6 months revealed degenerative spine with multilevel osteoarthritis as confirmed on lateral lumbar radiograph. Pain resolved after injection



## Discussion

There have been various review articles on how to assess and diagnose the cause of a painful total knee arthroplasty [9, 16–18]. It has long been a medical adage that thorough history and examination will reveal the majority of diagnoses and it is important to consider the joint above and below the one in question due to the real possibility of referred pain, and this is in line with the consensus of the literature [19, 20]. Gonzalez and Mekhail [10] proposed a four-step assessment algorithm including history, examination, radiographic evaluation and laboratory analysis.

Early causes of pain include infection, instability (poor soft tissue balancing), malpositioned components with patellofemoral maltracking and soft tissue impingement. Late causes of pain include loosening, distant-spread infection or fractures. Mandalia et al. [20] suggested that the characteristic of the pain is particularly important; if it has remained completely unchanged post-operatively, it is likely to be caused by an extrinsic problem, e.g. hip arthritis or nerve entrapment in the spine.

We found in our study that of the 45 patients with painful knee arthroplasty, seven had moderate to severe ipsilateral hip osteoarthritis and eight had symptomatic spinal degenerative causes which was confirmed on MRI, and in all cases

following steroid and local anaesthetic infiltration, there was relief of pain at six months follow-up. Of the seven patients who were subsequently diagnosed with hip osteoarthritis, six patients had never had a hip radiograph prior to TKR. It is difficult to know whether their hip and spinal pathologies were the cause of knee pain prior to their TKR or whether there has been progression of the disease. However, on further questioning all felt they had never achieved complete relief of symptoms. This may have been because of an incorrect primary diagnosis of knee osteoarthritis.

Kleiner et al. [21] successfully used intra-articular hip anaesthetic injections to help differentiate the source of pain in 18 patients who had equivocal radiological signs of hip and spine pathology; in 17 cases there was complete relief of hip symptoms. In our series, none of the 15 patients with hip and lumbar spine degeneration had pre-operative injections. We would advocate a heightened awareness during assessment pre- and post-operatively, and using pre-operative injections into the hip joint and/or spine in patients with poorly localised symptoms, or pain in multiple joints, as they have been shown to relieve pain in the short term [22, 23] and will aid diagnosis and may reduce the chance of a painful knee arthroplasty.

Nine patients had no obvious cause of pain and had normal inflammatory markers, plain radiographs and CT

**Fig. 2** **a** AP left knee, revealing a well-positioned TKR. **b** There was still no relief of pain 3 months after TKR, revealing osteochondral defect and collapse of subchondral cyst. **c** Left total hip replacement 6 months later relieved all symptoms



scans of their knees. These can cause a significant challenge to the orthopaedic surgeon. Bonnin et al. [4] performed a systematic review and found that female sex, patients younger at the time of surgery (<60 years old) and higher depressive or anxiety states had an increased chance of having a painful knee arthroplasty in the absence of intra-articular pathology. They therefore suggested high-risk patients should have more detailed pre-operative education on achieving realistic expectations. Our results are consistent with their study; eight of the nine patients were female and were more than 60 years old (mean 73), with the exception of one male patient who was 56 years old. It may be that some of the patients have chronic regional pain syndromes which account for 1–2% of patients with painful TKRs [24]. Surgery in general is a contraindication in these patients, as it is unlikely to relieve their symptoms. Guanethidine or sympathetic blockade may relieve their symptoms [25].

There have been extensive studies into the causes of painful knee arthroplasties, with considerable focus being directed at intra-articular pathologies. Sharkey et al. [8] reported on 212 cases of revision knee arthroplasties and sub-classified them into early (<2 years) or late failures (>2 years). They found polyethylene wear was the greatest cause of failures at 11.8 and 44.4% of early and late failures, respectively. Infection was the greatest cause (25.4%) of early failures, however only 7.8% of late failures. Other causes included loosening, instability, arthrofibrosis, malalignment or malposition, extensor mechanism deficiency and avascular necrosis. There were also several patients with patellofemoral arthritis, and it is still unclear whether the patella should be resurfaced [26]. There was not a single case of an unidentified cause of failure; however, this may be explained by revision surgery only being undertaken in the presence of a proven cause of failure.

Mont et al. [13] reviewed 27 patients who underwent exploration of their painful TKRs due to persisting pain with no obvious cause. There was 12 cases with identifiable causes of failure or excessive laxity. In 15 cases only synovial proliferation or scarring was found. Only 41% of patients had successful outcomes with adequate reduction of pain. There was no mention of selection criteria, and whether or not patients had their hip and spines investigated for degeneration, which we found to be the cause of persistent pain in 33% of our patients.

Adequately assessing pre-operative patients remains a challenge to the orthopaedic surgeon. When assessing patients pre-operatively, we approach patients with an increased awareness that extrinsic pathology may be the cause of pain. Patients with persisting, unremitting pain may have pain arising from a neurological cause, and those who have pain on getting up from a chair often have hip osteoarthritis. Whilst examining the joint, we try and isolate the hip joint, by keeping the knee in extension whilst gently applying rotational forces which can aid the diagnosis of hip

osteoarthritis. Standard radiographs demonstrate poor accuracy in detecting joint space narrowing, and in addition to weight-bearing full extension views (AP, lateral and skyline views), we routinely obtain schuss views (knee flexed to 30°) which has been shown to be the most accurate method for evaluating femorotibial osteoarthritis [27]. We have a low threshold for ordering hip and spine radiographs, and consider diagnostic injections if the diagnosis remains in doubt.

The aim of this study was to evaluate the common reasons for referral of patients with pain following a primary knee arthroplasty. We have shown that although total knee arthroplasty has the potential to significantly improve a patient's quality of life, there are still significant numbers of patients (10–30%) who complain of persistent post-operative knee pain. Pain may either be due to failing components, infection, loosening or malposition, or due to extra-articular causes, which include lumbar spinal or hip degenerative diseases. Our local results suggest that patients may still be receiving knee arthroplasties for misdiagnosed sources of pain and we advise thorough pre-operative assessment with hip and spine examinations documented, with supporting radiographs. If the diagnosis still remains unclear, then a diagnostic injection should be administered into the relevant joints. We would welcome a national or multi-centre study to confirm our findings

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